

**K.C.S.E
CHEMISTRY
PAST PAPERS & MAKING SCHEME
PAPER 233/1, 233/2**

**Chemistry paper 233/1
K.C.S.E 1995 QUESTIONS**

- The electron arrangement ions X^{3-} and Y^{2-} are 2, 8, and 2, 8, 8 respectively.
 - Write the electronic arrangement of the elements X and Y. (2 mks)
 - Write the formula of the compound that would be formed between X and Y.
- When bromine gas reacts with aqueous sodium hydroxide, the *equilibrium* represented by the equation: $Br_{2(aq)} + 2OH^{-}(aq) \rightleftharpoons Br^{-}(aq) + OBr^{-}(aq) + H_2O$ is established.
What observations would be made if a few drops of sulphuric acid were added to the equilibrium mixture? Explain.
- Calculate the amount of calcium carbonate that would remain if 15.0g of calcium carbonate were reacted with 0.2 moles of hydrochloric acid.
The equation for the reaction is $CaCO_{3(g)} + 2HCl \rightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O(g)$
(C = 12.0 = 1.60, Ca = 40.0)
- In an experiment, soap solution was added to three separate samples of water. The table below shows the volumes of soap solution required to form lather with 1000cm³ of each sample of water before and after boiling.

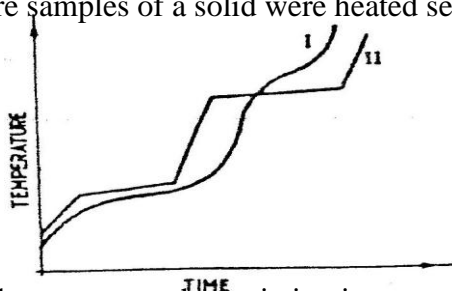
	Sample I	Sample II	Sample III
Volume of soap before water is boiled (cm ³)	27.0	3.0	10.6
Volume of soap after water is boiled	27.0	3.0	3.0

- Which water sample is likely to be soft? Explain. (2mks)
 - Name the change in the volume of soap solution used in sample III (1mk)
- Name one natural fibre.
 - Give one advantage of synthetic fibres over natural fibres. (1mk)
 - The table below gives some properties of gases D and E.

Gas	Density	Effects of H ₂ SO _{4(aq)}	Effects of NaOH _(aq)
D	Lighter than air	Reacts to form a salt	Dissolves without reacting
E	Heavier than air	Not affected	Not affected.

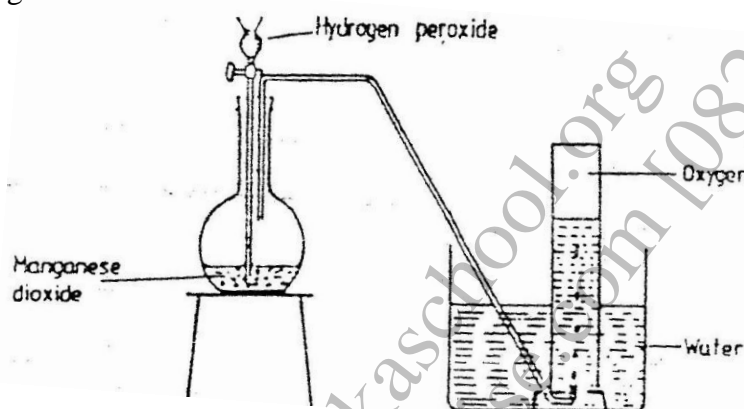
- Describe how you would obtain a sample of E from a mixture of gases D and E. (2mks)
- Suggest a possible identity of gas D. Give a reason for your answer. (1mk)

7. The curve below represents the variation of temperature with time when pure and impure samples of a solid were heated separately.

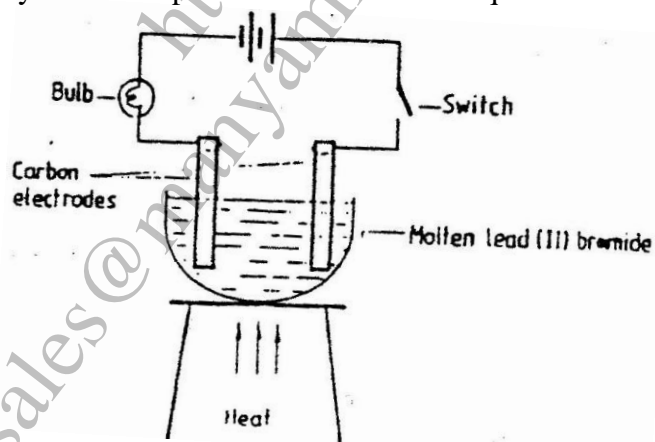


Which curve shows the variation in temperature for the pure solid? Explain (2mks)

8. The diagram below represents a set – up that can be used to prepare and collect oxygen.

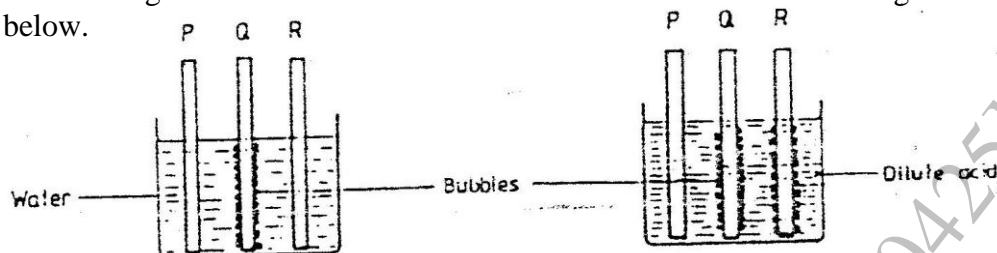


- Write an equation for the reaction that takes place (1mk)
 - What property of oxygen makes it possible for its collection as indicated by the diagram (1mk)
 - Explain why it is important not to collect any gas for the first few seconds of the experiment. (1mk)
9. Study the set – up below and answer the question that follows.



State and explain the observations that would be made when the circuit is completed.

10. In an experiment, rods of metals P, Q and R were cleaned with sand paper and placed in a beaker containing water. Another set of rods was also cleaned and placed in a beaker containing dilute acid. After placing the rods in the two liquids bubbles of gas were seen around some of the rods as shown in the diagrams below.

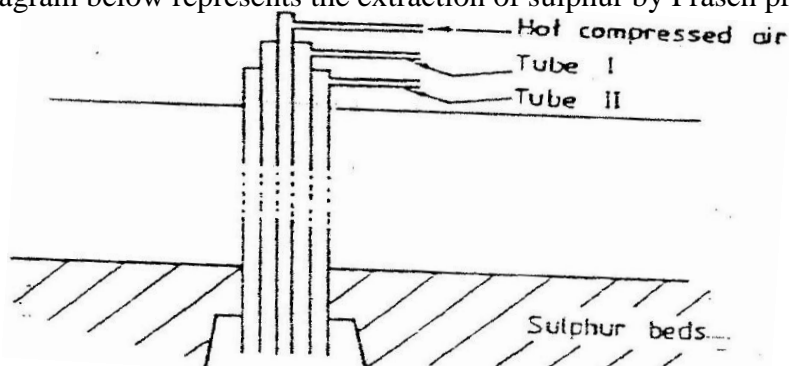


- a) Why is it necessary to clean the rods with sand paper before dipping them into the liquids. (1mk)
- b) Arrange the three metals in order of their reactivity starting with the most reactive.
11. A Solution of chlorine in tetra chloromethane turns colourless when propene gas is bubble through it.
- a) What type of reaction takes place? (1mk)
- b) Write an equation for the above reaction (1mk)
12. With reference to atomic number of one, explain why hydrogen can be placed in either group I and VII of the periodic table. (2mks)
13. a) Explain why it is not advisable to use wood ash for cleaning aluminium Utensils (2mks)
- b) Duralumin is an alloy of aluminium. What is the advantage of using duralumin in place of aluminium for manufacture of aeroplane parts. (1mk)
14. A compound has an empirical formula, C_3H_6O and a relative formula mass of 16. Determine its molecular formula ($H = 1.0, C = 12.0, O = 16.0$) (2mk)
15. Explain how you would separate mixture of nitrogen and oxygen gases given that their boiling points are $-196^\circ C$ and $183^\circ C$ respectively (2mks)
16. Study the table below and answer the questions that follow.

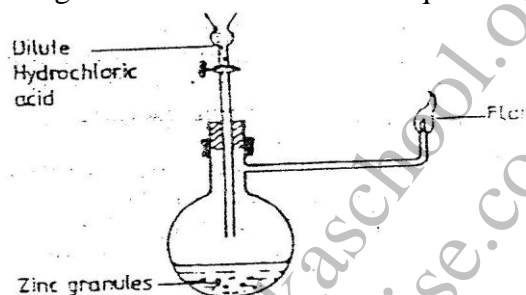
Alkane	Formula	Heat of combustion (ΔH_c) $kJmol^{-1}$
Methane	CH_4	890
Ethane	C_2H_6	1560
Propane	C_3H_8	2220
Butane	C_4H_{10}	

- a) Predict the heat of combustion of butane and write it on the space provided in the table above? (1mk)
- b) What does the sign of ΔH_c value indicate about combustion of alkenes? (1mk)

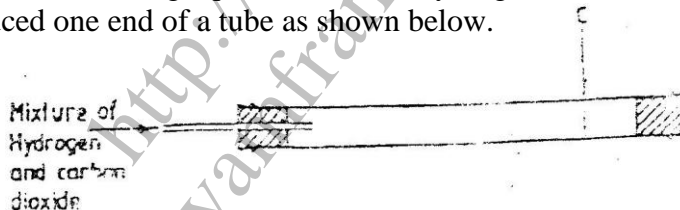
17. The diagram below represents the extraction of sulphur by Frasch process



- a) Name the substance that passes through tube;
I
II
- b) What is the purpose of hot compressed air in this process? (1mk)
18. Study the diagram below and answer the questions that follow.



- Write an equation for each of the two reactions that take place in the experiment represented by the diagram above (2mks)
19. A mixture containing equal volumes of hydrogen and carbon dioxide was introduced one end of a tube as shown below.



- Which gas would be detected at appoint C in first? Explain (2mks)
20. The table below gives three experiments on the reaction of excess sulphuric acid and 0.5g of zinc done under different conditions. In each the volume of gas was recorded at different time intervals.

Experiment	Form of Zinc	Sulphuric acid solution
I	Power	0.8m
II	Power	1.0m
III	Granules	0.8m

On the axis below draw and label the three curves that could be obtained from such results.

21. The table shows how solubility of some substances in water varies with temperature.

Substance	Change of O°C	Solubility 20°C	With temperature 40°C	(g/100cm ³ of water) 60°C
W	0.334	0.16	0.097	0.0058
X	27.60	34.0	40.0	45.5
Y	35.70	36.0	36.6	37.3

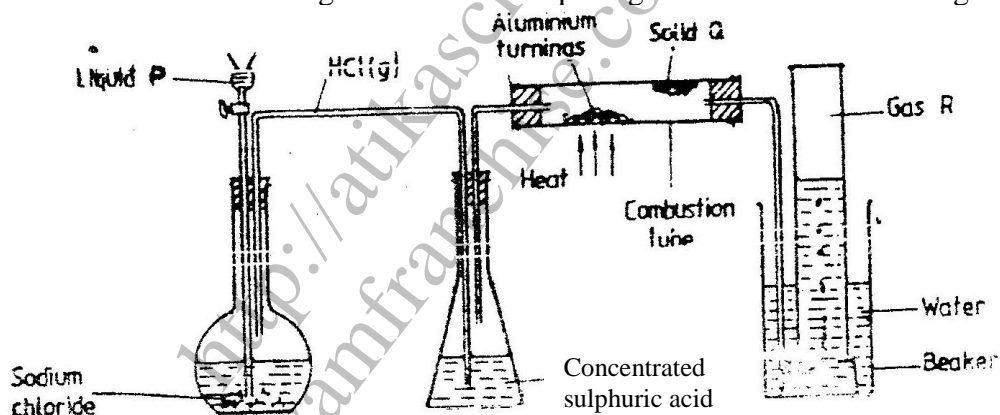
- Which of the above substances is likely to be a gas? Explain (2mks)
22. Dilute nitric acid reacts with copper according to the equation;
 $3\text{Cu}_{(s)} + 8\text{H}^{+}_{(aq)} + 2\text{N}_3^{-} \longrightarrow 3\text{Cu}^{2+}_{(aq)} + 2\text{NO}_{(g)} + 4\text{H}_2\text{O}_{(l)}$
- a) What is the oxidation number of nitrogen in?
 i) 2N_3
 ii) NO
- b) With respect to nitrogen, explain whether the above reaction is an oxidation or reduction process. (1mk)
23. Explain the following observation. A chloride dissolves in water to form an electrolyte while the same chloride dissolves in methylbenzene to form a non-electrolyte. (1mk)
24. State what would be observed when dilute hydrochloric acid is added to the products formed when a mixture of iron filings and sulphur? (1mk)
25. Describe how the following reagents can be used to prepare lead sulphate solid potassium sulphate, solid lead carbonate, dilute nitric acid and distilled water.
26. Explain why the enthalpy of neutralization of ethanoic acid with sodium hydroxide is different from that of hydrochloric acid with sodium hydroxide. (2mks)
27. Give a reason why calcium hydroxide solution is used to detect the presence of carbon dioxide gas while sodium hydroxide is NOT?
28. a compound $\text{C}_4\text{H}_{10}\text{O}$ is oxidized by excess acidified potassium permanganate to form another compound $\text{C}_4\text{H}_8\text{O}_2$. The same compound $\text{C}_4\text{H}_{10}\text{O}$ reacts with potassium to produce hydrogen gas.
 a) Draw the structural formula and name the compound $\text{C}_4\text{H}_{10}\text{O}$ (1mk)
 b) Write an equation for the reaction between potassium and compound $\text{C}_4\text{H}_{10}\text{O}$.
29. During the production of hydrogen iodide, hydrogen reacts with iodine according to the equation:
 $\text{H}_{2(g)} + \text{I}_{2(g)} \rightleftharpoons 2\text{HI}_{(g)}; 52.0 \text{ kJ}$
 Explain how the following would affect the yield of hydrogen iodide:
 a) Increase in temperature
 b) Increase in pressure. (2mks)
30. a) 100gm of radioactive $^{233}_{91}\text{Pa}$ was reduced to 12.5g after 81 days.
 Determine the half-life of Pa. (2mks)
- b) $^{233}_{91}\text{Pa}$ decays by beta emission. What is the mass number and Atomic number of the element formed? (1mk)

**CHEMISTRY K.C.S.E 1995 PAPER 233/2
QUESTIONS**

1. The table below gives information on four elements by letters K, L, M and N. Study it and answer the questions that follow. The letters do not represent the actual symbols of the elements.

Element	Electron arrangement	Atomic radius (nm)	Ionic radius(nm)
K	2, 8, 2	0.136	0.065
L	2, 8, 7	0.099	0.181
M	2, 8, 8, 1	0.203	0.133
N	2, 8, 8, 2	0.174	0.099

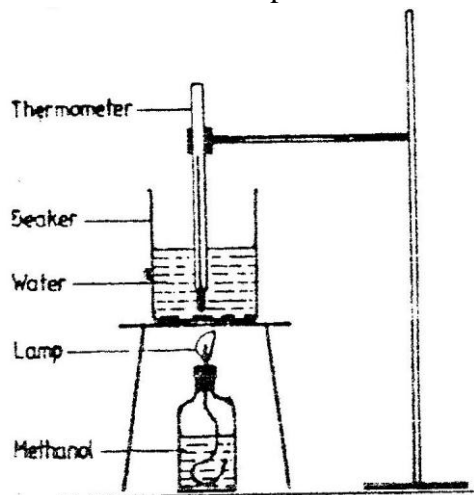
- a) Which two elements have two similar properties? Explain (2mks)
- b) What is most likely formula of oxide of L? (1mk)
- c) Which element is a non-metal? Explain (1 mk)
- d) Which one of elements is the strongest reducing agent? Explain (2mks)
- e) Explain why ionic radius of N is less than that of M (2mks)
- f) Explain why the ionic radius of L is bigger than its atomic radius (2mks)
- 2 a) IN an experiment hydrogen chloride gas was prepared and reacted with aluminium turnings to form a solid q and gas R as shown in the diagram



- (i) Name: Liquid P
: Solid Q (1mk)
: Gas R (1mk)
- (ii) Name another substance that could serve the same purpose as the concentrated sulphuric acid. (1mk)
- (iii) Explain the following observation. When blue litmus paper was dipped into the water in the beaker at the end of the experiment it turned red.
Explain why solid Q collects farther away from the heated aluminium (2mks)
- (b) (i) Write an equation for the reaction that takes place between ammonia gas and hydrogen gas (1mk)

(ii) Calculate the mass of the product that would be formed when 2000cm³ of hydrogen chloride gas reacts completely with excess ammonia gas (H=1, O; N= 14.0, C1 = 35.5, one mole of gas occupied 24 litres at room temperature and pressure.) (3mks)

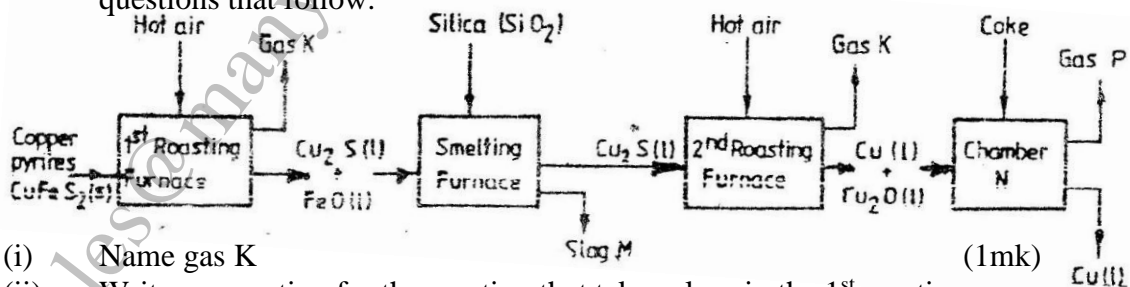
3. In an experiment to determine the heat of combustion of methanol, CH₂OH a student used a set up like the one shown in the diagram below.



Volume of water = 500cm³
 Final temperature of water = 27.0⁰C
 Initial temperature of water = 20.0⁰C
 Final mass of lamp + methanol = 22.11g
 Initial mass of lamp + methanol = 22.98g
 Density of water = 1.0g cm³

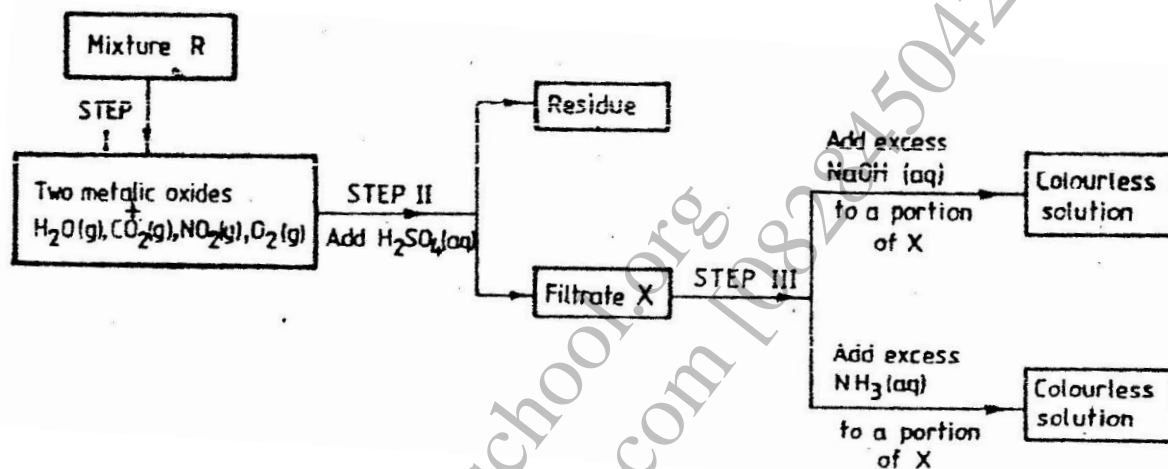
- Write an equation for the combustion of methanol
- Calculate:
 - The number of moles of methanol used in this experiment (C = 12; O = 16; H = 1).
 - The heat of combustion per mole of methanol. (1mk)
 - The heat of combustion per mole of methanol (2mks)
- Explain why the value of the molar heat of combustion for methanol obtained in this experiment is different from the theoretical value.
- On the axis below draw an energy level diagram for the combustion of methanol.

4. a) The flow chart below outlines some of the process involved during extraction of copper from copper pyrites. Study it and answer the questions that follow.

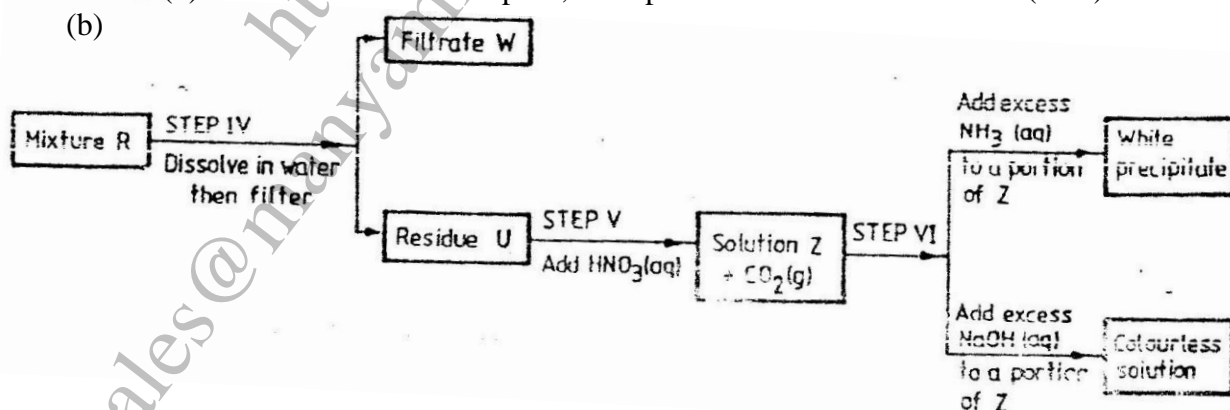


- Name gas K (1mk)
- Write an equation for the reaction that takes place in the 1st roasting furnace. (1mk)
- Write the formula of the cation present in slag M (1mk)
- Identify gas p (1mk)
- What name is given to the reaction that takes place in chamber N? Give a reason for the answer. (1mk)

- (b) The copper obtained from chamber N is not pure. Draw a labeled diagram to show the set up you would use to refine the copper by electrolysis. (3mks)
- (c) Given that the mass of copper obtained from above extraction was 210kg, determine the percentage purity of the ore(copper pyrites) if 810kg of it was fed to the 1st roasting furnace. (Cu = 63.5, Fe = 56.0, s=32.0) (3mks)
- (d) Give two effects that this process could have on the environment (2mks)
5. The flow charts below show an analysis of a mixture R that contains two salts. Study the analysis and answer the questions that follow.



- (a) (i) What condition is necessary for the process in step I to take place? (1mk)
- (ii) Draw a labeled diagram for the set-up that could be used to separate the mixture formed in step II (2mks)
- (iii) Write ionic equation for the reaction between the cation in filtrate X and aqueous ammonia. (1mk)
- (iv) What observation would indicate the presence of $\text{NO}_2(\text{g})$ in step I (1mk)
- (v) State how water vapour, in step I could be identified. (1mk)

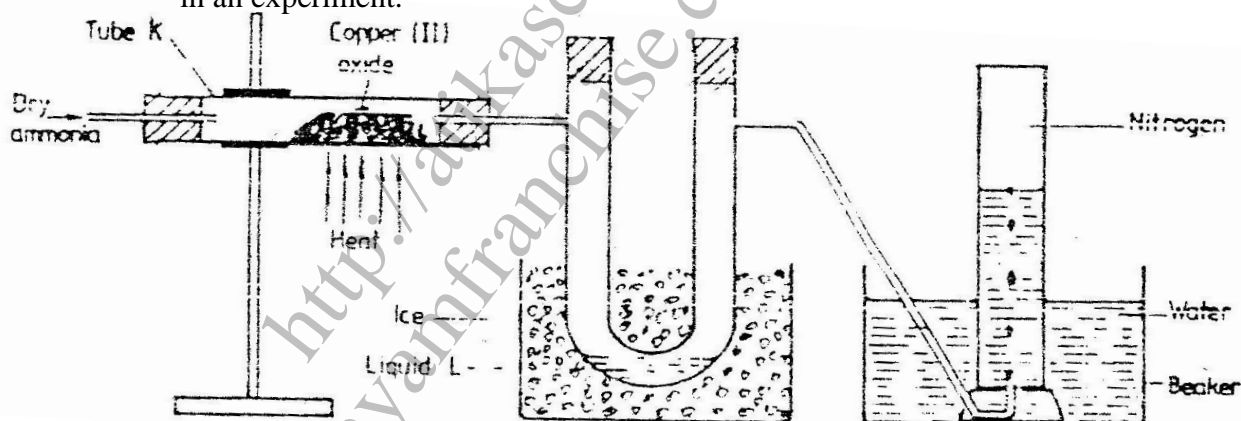


- (i) What conclusion can be drawn from step iV only? Explain? (2mks)
- (ii) Write the formula of an anion present in the residue U. Explain (2mks)
- (iii) Suggest the identity of the cation present in solution z. (1mk)
- (c) Name the two salts present in the mixture R. (2mks)

6. (a) The table below gives information about the major constituents of crude oil. Study it and answer the questions that follow.

Constituent	Boiling point ($^{\circ}\text{C}$)
Gases	Below 40
Petrol	40-175
Kerosene	175-250
Diesel oil	250-350
Lubricating oil	350-400
Bitumen.	Above 400

- (i) Which one of the constituents of crude oil has molecules with the highest number of carbon atoms? (2mks)
- (ii) Name the process you would use to separate a mixture of petrol and diesel and explain how the separation takes place. (2mks)
- (iii) Explain why the constituent of crude oil and write its formula (1mk)
- (iv) Name one gas that is likely to be a constituent of crude oil and write its formula. (1mk)
- (b) What condition could cause a poisonous gas to be formed when Kerosene is burnt? Explain (2mks)
- (c) Give one use of bitumen (1mk)
7. (a) The diagram below shows a set-up that can be used to obtain nitrogen gas in an experiment.



- (i) Name liquid L (1mk)
- (ii) What observation would be made in tube K after heating for some time? (1mk)
- (iii) Write an equation for the reaction that took place in tube K. (1mk)
- (iv) If 320 cm^3 of ammonia gas reacted completely with the copper? Calculate:
- I Volume of nitrogen gas produced. (1mk)
- II the mass of copper oxide that reacted (3mks)
(Cu = 63.5, O=16.0, one mole of gas occupies 24 liters at room temperature and pressure)
- (v) At the end of experiment the PH of the water in the beaker was found to be about 1) Explain (2mks)

- (b) In another experiment a gas jar containing ammonia was inverted over a burning splint. What observation would be made? (1mk)
- (c) Why is it advisable to obtain nitrogen from air instead ammonia? (1mk)

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